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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/989,377
Filing Date: November 21, 2001
Appellant(s): HOFNER ET AL.

Robert Hofner
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed on 2/26/07 appealing from the Office action mailed on 4/12/06

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

6067545	Wolff	May 23, 2000
5699510	Peterson et al.	December 16, 1997
20020107962	Richter et al.	August 8, 2002

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1-3, 5-7, 9, 10, 16 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wolff (US 6067545) in view of Peterson (US 5699510)

Claim 1, 9 Wolff discloses client nodes (Col 4 lines 34-47).

Wolff discloses network resources (Col 4 lines 34-47 and Col 6 lines 6-17 and element 122 in fig 1B).

Wolff discloses a client performing load balancing where a path is remapped to a resource (Col 4 lines 34-60).

Wolff discloses a communication medium connecting a number of servers to a number of clients (Col 5 lines 15-22).

Wolff discloses a remapped path (redundant communication path) between the client and resources (Col 4 lines49-60).

Wolff does not specifically disclose at least one matching resource.

Peterson et al. discloses two controllers (matching) connected to one another, in which one controller acts as a mirror (redundant resource) to the other (Col 2 line 65-Col 3 line 13)

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify each resource as disclosed by Wolff to have a matching resource as disclosed by Peterson. The motivation for this modification is to provide a fault tolerant environment (Col 3 lines 4-12).

Claim 2 Wolff discloses a communication medium connecting a number of servers to a number of clients, where the communication medium may be any network type (Col 5 lines 15-22). It would have been obvious to one of the ordinary skill in the art at the time of the invention that any medium may be selected, where a number of possible networks may be implemented as disclosed by Wolff.

Claim 3 Wolff discloses the network being of a network type such as a packet switched local area network (Col 5 lines 15-22). It would have been obvious to one of the ordinary skill in the art at the time of the invention that a switching element is employed within this communication medium.

Claim 5, 6 Wolff discloses resources including any type of memory device, including a file system (Col 4 lines 34-47), where it would have been obvious to one of the ordinary skill in the art at the time of the invention that any memory device can be chosen from the group of memory devices.

Claim 7 Wolff does not specifically disclose the network resource and at least one redundant matching resource being continuously interchangeable.

Peterson discloses two controllers connected to one another, where the memory of each controller is connected, and memory from one memory is duplicated in another (Col 3 line 65- Col 3 line 13).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the teachings of Wolff to allow the interconnection of resources as disclosed by Peterson. The motivation for this modification is to provide a fault tolerant environment (Col 3 lines 4-12).

Claim 10 Wolff discloses an I/O request being received for a particular (assigned) resource (Col 1 lines 56-65).

Wolff discloses a path table for determining a communication path (Col 5 lines 37-58).

Wolff discloses a resource subscriber module for responding to a request, where the response includes resource information including availability (Col 12 lines 50-54), where it would have been obvious to one of the ordinary skill in the art at the time of the invention that resource information may include that determined path.

Claim 16 Wolff discloses an I/O request being received for a particular (assigned) resource (Col 1 lines 56-65).

Wolff discloses assigning a resource (col. 6 lines47- col. 7, line 13)

Wolff discloses a path table for determining a communication path (Col 5 lines 37-58).

Wolff does not specifically disclose informing the requestor of the assigned network resources and the assigned communication path.

Peterson discloses a request being sent to a controller, and a response being issued by the controller indicating the granting of the request (Col 4 line 52- Col5 line2).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to combine the determination of the resource and path in the server as disclosed by Wolff, with a response to the client (requestor), where the response includes the determined path and resource. The motivation for this combination is to respond to a request with acknowledgement, resulting in easier detection of a fault.

Claim 22 Wolff discloses software modules for performing a number of functions (Col 8 lines 43-60).

Wolff discloses an I/O request being received for a particular (assigned) resource (Col 1 lines 56-65).

Wolff discloses assigning a resource (col. 6 lines47- col. 7 lines 13)

Wolff discloses a path table for determining a communication path (Col 5 lines 37-58).

Wolff does not specifically disclose informing the requestor of the assigned network resources and the assigned communication path.

Peterson discloses a request being sent to a controller, and a response being issued by the controller indicating the granting of the request (Col 4 line 52- Col5 line2). It would have been obvious to one of the ordinary skill in the art at the time of the invention to combine the determination of the resource and path in the server as

disclosed by Wolff, with a response to the client (requestor), where the response includes the determined path and resource. The motivation for this combination is to respond to a request with acknowledgement, resulting in easier detection of a fault.

3. Claims 4, 8, 11, 12, 13, 14, 15, 17-20 and 23-26 and 28-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wolff (US 6067545) in view of Peterson et al. (US 5699510) in further view of Richter (US 20020107962)

Claim 4 Wolff discloses the network being of a network type such as a packet switched local area network (Col 5 lines 15-22).

Wolff does not specifically disclose the element being selected from a group consisting of a network switch and a cache control node.

Richter discloses a storage management engine for performing cache processing and data switching (paragraph 0073).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the network as disclosed by Wolff to implement a storage management engine as disclosed by Richter. The motivation for this modification is to allow the network to perform switching and caching functions.

Claim 8 Wolff discloses load balancing among a number of servers (Col 19 lines 51-Col 20 line8 and Col 6 lines 6-17).

Wolff does not specifically disclose load balancing by concurrently assigning tasks to the network resource and the redundant matching resource.

Richter discloses tasks being assigned to a processor, where a number of processors (elements 13a) exist independently (paragraph 0037), where it would have been obvious to one of the ordinary skill in the art at the time of the invention that if the processors exist independently, tasks may be assigned or processed simultaneously.

The motivation for this modification is to increase speed and efficiency in performance of a task (paragraph 0037).

Claim 11 Wolff discloses performing load balancing by forming a table comprising information of the resources utilization (Col 25 lines 40-Col 26 line24).

Wolff does not specifically disclose if the number of available resources is larger than one, executing a selection function to determine the at least one network resource to be assigned, and assigning that resource to the requestor, and if the number of available network resources is equal to one, assigning the available resource to the requestor.

Richter discloses a number of load balancing algorithms that may be utilized in order to assign a processing unit to a request. Richter discloses a number of processing units, in which one is selected based on the load balancing algorithm (paragraphs 0175-0177), where it would have been obvious to one of the ordinary skill in the art at the time of the invention that if only one processing unit existed, there would be only one selection.

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the use of the utilization information of different resources as disclosed by Wolff, within a load balancing algorithm as disclosed by Richter, in order to

make selections based on the utilization. The motivation for this modification is to ensure that resources are fully utilized.

Claim 12, 14, 35, 38 The combined teachings of Wolff and Peterson do not disclose the selection function being selected from a group comprising round robin function, a weighted round robin function, a random function, a least loaded function and a least recently used function.

Richter discloses any load balancing algorithm being used, including a round robin approach, a weighted round robin approach, an approach based on queue depth, or an approach based on some form of feedback from a processing unit, where it would have been obvious to one of the ordinary skill in the art at the time of the invention that any one of these algorithms may be selected depending on a users preference.

Claim 13 Wolff discloses multiple paths to a resource (Col 18 lines 22-49).

Wolff discloses path utilization information, which is used in the event of a re-direct command when a primary path has failed. Wolff discloses redirecting data to a path, which is selected, based on the lowest utilization information (Col 19 lines 51-Col 20 line 8 and Col 25 lines 40-Col 26 line 24).

Wolff does not specifically disclose if the number of available communication paths is larger than one, executing a selection function to determine the at least one communication path to be assigned, and informing the requestor, and if the number of available communication paths is equal to one, assigning the available resource to the requestor.

Richter discloses a number of load balancing algorithms that may be utilized in order to assign a processing unit to a request, where it would have been obvious to one of the ordinary skill in the art at the time of the invention to consider each processing unit a different communication path. Richter discloses a number of processing units, in which one is selected based on the load balancing algorithm (paragraphs 0175-0177), where it would have been obvious to one of the ordinary skill in the art at the time of the invention that if only one processing unit existed, there would be only one selection.

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the use of the utilization information of different paths as disclosed by Wolff, within a load balancing algorithm as disclosed by Richter, in order to make a selection of a path based on the utilization.

Claim 15 Wolff discloses a failover module determining a failure, where when an alternate path exists, an I/O command is reissued and the failed path is marked as failed. (col. 18 line49-col 19 line 14).

Wolff does not specifically disclose if no alternate communication path exists, issuing an error notification and a failure of a resource.

Richter discloses reassignment of network resources in the event of a failure to a resource (paragraph 0169).

Richter discloses in the event that a request cannot be processed, notifying a requestor of an error (paragraph 0150).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the failover procedure as disclosed by Wolff, to accommodate for

resource failure as disclosed by Wolff, where if no alternate path or resource exists, sending a notification to the given requestor. The motivation for this modification is to implement fault tolerance for both path failure and resource failure.

Claim 28, 29 Wolff discloses client nodes (Col 4 lines 34-47).

Wolff discloses the client nodes communicating with resources via a packet switched networks, where the client nodes communicate with nodes within the network in order to communicate with the resources (storage control nodes), where nodes may include routers (switches) as disclosed in Col 4 lines 34-48. Wolff discloses a client node being able to communicate with a resource through an alternate node (Col 14 line 58 – col. 15 lines 37).

Wolff discloses a memory resource containing a configuration database including a resource database and directory/access table, where it would have been obvious to one of the ordinary skill in the art at the time of the invention that this database performs address resolution.

Wolff discloses performing load balancing by forming a table comprising information of the resources utilization (Col 25 lines 40-Col 26 line24).

Wolff does not specifically disclose at least two cache control nodes and 2 storage control nodes.

Peterson et al. discloses two controllers (matching) connected to one another, where one controller acts as a mirror (redundant resource) to the other (Col 2 line 65-Col 3 line 13).

Peterson does not specifically disclose a cache control node

Richter discloses a storage management engine for performing cache processing and data switching (paragraph 0073).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the configuration database and load balancing procedures as disclosed by Wolff, to be performed within the storage controller as disclosed by Richter, where there are two controllers as disclosed by Peterson so as to enable fault tolerant environment (Col 3 lines 4-12).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the network as disclosed by Wolff to implement a storage management engine as disclosed by Richter. The motivation for this modification is to allow the network to perform switching and caching functions.

Claim 30, 31, and 32 Wolff does not specifically disclose one of the cache nodes being used as a redundant cache control node.

Peterson et al. discloses two controllers (matching) connected to one another, where one controller acts as a mirror (redundant resource) to the other (Col 2 line 65- Col 3 line 13).

Peterson discloses in the event of failure, the second controller providing a seamless failover option (Col 2 line 65- Col 3 line 13).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify each resource as disclosed by Wolff to have a matching resource as disclosed by Peterson. The motivation for this modification is to provide a fault tolerant environment (Col 3 lines 4-12).

Claim 33 Wolff does not specifically disclose the cache control node generating a media access control address corresponding to a storage control node.

Richter discloses a network interface engine generating a MAC address dedicated for a processing unit (paragraph 0058).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the combined teachings of Wolff and Peterson, to allow the control unit as disclosed in the rejection of claim 28, to generate a media access control address for identification purposes.

Claim 34 Wolff discloses performing load balancing which chooses a next node to redirect a request based on a node utilization database (Col 25 lines 21-Col 26 lines23).

Wolff does not specifically disclose the media access control address for specifying the storage control node.

Richter discloses a network interface engine generating a MAC address dedicated for a processing unit (paragraph 0058).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the combined teachings of Wolff and Peterson, to allow the control unit as disclosed in the rejection of claim 28, to generate a media access control address for identification purposes.

Claim 36 Wolff discloses multiple paths from the client to a resource (Col 18 lines 22-49).

Wolff does not specifically disclose a media access control address for specifying a network path to be used.

Richter discloses a network interface engine generating a MAC address dedicated for a processing unit (paragraph 0058).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the combined teachings of Wolff and Peterson to generate a MAC identification as disclosed by Richter, for the specific path chosen as disclosed by Wolff. The motivation for this modification is for identification purposes.

Claim 37 Wolff discloses performing load balancing which chooses a next path to redirect a request based on a node utilization database (Col 25 lines 21-Col 26 lines23).

Wolff does not specifically disclose the media access control address for specifying the next path.

Richter discloses a network interface engine generating a MAC address dedicated for a processing unit (paragraph 0058).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the combined teachings of Wolff and Peterson, to allow the control unit as disclosed in the rejection of claim 28, to generate a media access control address as disclosed by Richter, for the specific path chosen as disclosed by Wolff. The motivation for this modification is for identification purposes.

Claim 17, 23 Wolff discloses performing load balancing by forming a table comprising information of the resources utilization (Col 25 lines 40-Col 26 line24).

Wolff does not specifically disclose if the number of available resources is larger than one, executing a selection function to determine the at least one network resource to be assigned, and assigning that resource to the requestor, and if the number of available network resources is equal to one, assigning the available resource to the requestor.

Richter discloses a number of load balancing algorithms that may be utilized in order to assign a processing unit to a request. Richter discloses a number of processing units, in which one is selected based on the load balancing algorithm (paragraphs 0175-0177), where it would have been obvious to one of the ordinary skill in the art at the time of the invention that if only one processing unit existed, there would be only one selection.

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the use of the utilization information of different resources as disclosed by Wolff, within a load balancing algorithm as disclosed by Richter, in order to make selections based on the utilization. The motivation for this modification is to ensure that resources are fully utilized.

Claim 18, 20, 24, 26 Wolff does not disclose the selection function being selected from a group comprising round robin function, a weighted round robin function, a random function, a least loaded function and a least recently used function.

Richter discloses any load balancing algorithm being used, including a round robin approach, a weighted round robin approach, an approach based on queue depth, or an approach based on some form of feedback from a processing unit, where it would have been obvious to one of the ordinary skill in the art at the time of the invention that any one of these algorithms may be selected depending on a users preference.

Claim 19, 25 Wolff discloses multiple paths to a resource (Col 18 lines 22-49).

Wolff discloses path utilization information, which is used in the event of a re-direct command when a primary path has failed. Wolff discloses redirecting data to a path, which is selected, based on the lowest utilization information (Col 19 lines 51-Col 20 line 8 and Col 25 lines 40-Col 26 line 24).

Wolff does not specifically disclose if the number of available communication paths is larger than one, executing a selection function to determine the at least one communication path to be assigned, and informing the requestor, and if the number of available communication paths is equal to one, assigning the available resource to the requestor.

Richter discloses a number of load balancing algorithms that may be utilized in order to assign a processing unit to a request, where it would have been obvious to one of the ordinary skill in the art at the time of the invention to consider each processing unit a different communication path. Richter discloses a number of processing units, in which one is selected based on the load balancing algorithm (paragraphs 0175-0177), where it would have been obvious to one of the ordinary skill in the art at the time of the invention that if only one processing unit existed, there would be only one selection.

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the use of the utilization information of different paths as disclosed by Wolff, within a load balancing algorithm as disclosed by Richter, in order to make a selection of a path based on the utilization.

4. Claims 21 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wolff (US 6067545) in view of Richter (US 20020107962)

Claim 21, 27 Wolff discloses a failover module (software) determining a failure, where when an alternate path exists, an I/O command is reissued and the failed path is marked as failed (col. 18, line 49 – col. 19, line 14).

Wolff does not specifically disclose if no alternate communication path exists, issuing an error notification and a failure of a resource.

Richter discloses reassignment of network resources in the event of a failure to a resource (paragraph 0169).

Richter discloses in the event that a request cannot be processed, notifying a requestor of an error (paragraph 0150).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the failover procedure as disclosed by Wolff, to accommodate for resource failure as disclosed by Wolff, where if no alternate path or resource exists, sending a notification to the given requestor. The motivation for this modification is to implement fault tolerance for both path failure and resource failure.

(10) Response to Argument

(a) The appellant argued with respect to claim 1 as seen on page 17 within the last paragraph, that Wolff does not teach or suggest redundancy of systems. The examiner points to Wolff's fig 1B, where the resources 104B and 106B share the same memory resource 118, making the resources/servers redundant to one another, and furthermore as indicated by Col 6 lines 10-13, resources 104B-106B all include the same complementary processes for handling concurrent I/O requests, thus making the resources/servers redundant to one another, where redundancy by definition is merely characterized by repetition, where the functions of the servers are the same, and they both access the same memory resource, making them repetitive. The examiner also points out Col 6 lines 32-35, where both servers/resources perform the same functions, thus making them repetitive/redundant.

Furthermore, despite Wolff clearly showing redundancy of the systems, the examiner introduces further proof as to the redundancy of systems by using Peterson, where Peterson discloses 2 systems equivalent to the 2 resources/servers as disclosed by Wolff, where these systems are the same (redundant). The examiner also points out that both Wolff and Peterson use the redundancy feature in order to deal with failure of one of the systems or resources (see title of Peterson).

(b) The appellant argued with respect to claim 1 as seen in the first paragraph on page 17, that Wolff does not suggest moving tasks from a failing network resource to the matching redundant resource. The examiner maintains that Wolff discloses moving

tasks from a failing network resource **(104a from fig 1 is the initial resource, but upon detection of an overload/failure, an alternate path 76 is used to access the redundant resource 106A as can be seen from Col 5 lines 23-35)** to the matching redundant resource **(Col 6 lines 32-36, where 104A-106A are matching redundant resources).**

(c) The appellant argued with respect to claim 1, that Wolff does not disclose 2 independent communication paths as seen on page 17 paragraphs 2 and 3. The examiner points to fig1, where paths 74 and 76 are 2 independent paths from an aware client to server 104A via 74 and server 106A via 76. These paths are independent due to the fact that Wolff depicts them as 2 separate (independent) lines (one straight line and the other a dotted line).

Furthermore within the appellant's arguments on page 17, the appellant makes reference to a redundant communication path. The examiner notes that from the amendments made by the appellant, the claim does not make mention of a redundant communication path.

(d) The appellant argued with respect to claim 1, that Peterson does not provide any suggestion that a mirrored system can provide the capabilities of load balancing between two identical systems. The examiner points out that Peterson is only introduced to strengthen the fact that the servers/resources disclosed within Wolff are redundant. The rejection of claim 1 does not use Peterson to disclose load balancing, as Wolff discloses within Col 19 lines 30-50, that the client load balances between the

server nodes using a load balancer. Furthermore, the appellant admits to Wolff disclosing load balancing on page 19, the 2nd paragraph.

(e) The appellant argued that the examiner does not establish a prima facie case of obviousness. The examiner points out that it would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the system of Wolff, as taught by Peterson, since stated in Col 3 lines 5-12, that such a modification will provide a fault tolerant environment and seamless failover.

(f) The appellant argued with respect to claims 21 and 27 that the combination of Wolff and Ritcher do not teach load balancing, redundant communication path assignment features and a prima facie case of obviousness. The examiner points to (a)-(e) as these arguments have been addressed within.

(g) The appellant argued with respect to claims 4, 8, 11, 12, 13, 14, 15, 17-20, 23-26 and 29-38 that they were allowable for similar reasons as argued above. The responses to these arguments have been addressed in paragraphs (a)-(e) above.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Christopher Grey

/Christopher P Grey/

Examiner, Art Unit 2616

Conferees:

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